PATENT APPLICATION

IN THE U.S. PATENT AND TRADEMARK OFFICE

December 1, 1997

Applicant(s): Hidenari YASUI et al

For : PROCESS AND APPARATUS FOR BIOLOGICAL TREATMENT OF AQUEOUS ORGANIC WASTES

Serial No. : 08/309 868 Group : 1302

Filed : September 21, 1994 Examiner: C. Sherrer

Atty. Docket No.: Yanagihara Case 28[illegible]

The Commissioner of Patents and Trademarks
Washington, D. C. 20231

LETTER TRANSMITTING APPEAL BRIEF FEE

Sir:

Enclosed is Appellants' check in the sum of $310.00, representing payment of the Appeal Brief fee. The Commissioner is hereby authorized to charge any additional fee which may be required by this paper, or to credit any overpayment, to Deposit Account No. 06-1382. A duplicate copy of this sheet is enclosed.

IN DUPLICATE

Respectfully submitted,

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Appellants' Brief on Appeal
Appendix

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TENT APPLICATION

GP 1302 DR, 12-16-97

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FIRST CLASS MAILING CERTIFICATE

Sir:

I hereby certify that this correspondence is being deposited with the United States Postal Service under 37 CFR 1.8 as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on December 1, 1997.

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PATENT APPLICATION

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IN THE U.S. PATENT AND TRADEMARK OFFICE

December 1, 1997

12-23-97

Applicants : Hidenari YASUI et al

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APPELLANTS' BRIEF ON APPEAL

Sir:

This is an appeal from the decision of the Examiner, dated March 31, 1997, finally rejecting Claims 2-5, 11 and 12.

REAL PARTY IN INTEREST

Kurita Water Industries, Ltd., the assignee of the present application, is the real party in interest.

RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences to the present application.

STATUS OF CLAIMS

Claims 2-5, 11 and 12 are pending and are the claims on appeal. Claims 7-10 have been withdrawn from consideration as being directed to a non-elected invention. Claims 1 and 6 have been cancelled.

STATUS OF AMENDMENTS

The Amendment After Final Rejection dated September 30, 1997, has not been entered.

SUMMARY OF THE INVENTION

Appellants' invention, as defined in independent Claim 11, is directed to a process for the aerobic biological treatment of an aqueous organic waste. This process comprises the steps of introducing the aqueous organic waste into an aeration tank, aerating the aqueous organic waste in the aeration tank in the presence of a biosludge composed essentially of aerobic microorganisms to form an aerated aqueous suspension, withdrawing aerated aqueous suspension from the aeration tank and introducing it into a solid/liquid separation unit, subjecting the aerated aqueous suspension in the solid/liquid separation unit to solid/-liquid separation to form a separated sludge containing the biosludge and a separated liquid phase, withdrawing the separated liquid phase from the process as treated water, recycling at least a portion of the separated sludge back to the aeration tank, ozonizating either aerated aqueous suspension withdrawn from the aeration tank or a part of the separated sludge, the ozonizating taking place at a pH of 5 or lower, and recycling either the ozonized aerated aqueous suspension or the ozonized part of the separated sludge back to the aeration tank for aerobic biological treatment (specification page 4, last two lines, through specification page 5, lines 1-21).

The present invention, as defined in Claim 2, limits Claim 11 in requiring that the ozonizating step be performed at a pH of 5 or lower by the addition of a pH controlling agent (specification page 10, lines 1-4).

The present invention, as defined in Claim 3, limits Claim 11 in requiring that the process further comprise, prior to the step of ozonizating, a step of acidogenesis in which a part of the aerated aqueous suspension in the aeration tank or the separated sludge is subjected to an anaerobic biological treatment to adjust the pH thereof to a value of 5 or lower (specification page 10, lines 3-12).

The present invention, as defined in Claim 4, limits Claim 11 in requiring that the process further comprises a step of heating the aqueous suspension or the sludge to a temperature

between 50 and 100°C before or after the ozonizating step (specification page 19, lines 1-13). The present invention, as defined in Claim 5, limits Claim 11 in requiring that the biosludge at the aeration tank have a VSS/SS ratio maintaining a value of 0.2-0.7 and an MLVSS value maintained of 500-10,000 mg/l (specification page 24, lines 2-5).

Appellants' invention, as defined by independent Claim 12, is directed to a process for aerobic biological treatment of an aqueous organic waste. This method comprises the steps of introducing the aqueous organic waste into an aeration tank, aerating the aqueous organic waste in the aeration tank in the presence of a biosludge composed essentially of aerobic micro-organisms to form an aerated aqueous suspension, withdrawing aerated aqueous suspension from the aeration tank and introducing it to a membrane separation unit, subjecting the aerated aqueous suspension in the membrane separation unit to membrane separation to form a permeated liquid and a concentrated sludge containing the biosludge, withdrawing the permeated liquid from the process as treated water, recycling at least a portion of the concentrated sludge back to the aeration tank, ozonizating either aerated aqueous suspension withdrawn from the aeration tank or a part of the concentrated sludge, the ozonizating taking place at a pH of 5 or lower, and recycling either the ozonized aerated aqueous suspension or the ozonized part of the concentrated sludge back to the aeration tank for aerobic biological treatment (specification page 4, last two lines, through specification page 5, lines 1-21, and specification page 22, lines 23-27).

ISSUES

The first issue presented for review is whether Claims 2, 5, 11 and 12 are unpatentable under 35 USC 103 over Dorau et al in view of Hei et al or Berndt or Kramer et al. The second issue presented for review is whether Claims 3 and 4 are unpatentable under 35 USC 103 over Dorau et al in view of Hei et al or Berndt or Kramer et al and further in view of Brock.

GROUPING OF CLAIMS

Claims 2-5, 11 and 12 all stand or fall together.

ARGUMENT

The invention on appeal is directed to a process for the aerobic biological treatment of an aqueous organic waste. This process requires the aqueous organic waste to be introduced into an aeration tank where it is aerated in the presence of a biosludge composed essentially of aerobic microorganisms to form an aerated aqueous suspension, the aerated aqueous suspension withdrawn from the aeration tank and introduced into a solid/-liquid separation unit where the aerated aqueous suspension is subjected to solid/liquid separation to form a separated sludge containing the biosludge and a separated liquid phase, the separated liquid phase withdrawn from the process as treated water, at least a portion of the separated sludge recycled back to the aeration tank, either aerated aqueous suspension withdrawn from the aeration tank or a part of the separated sludge ozonized at a pH of 5 or lower and either the ozonized aerated aqueous suspension or the ozonized part of the separated sludge recycled back to the aeration tank for aerobic biological treatment. A membrane separation unit can be used to perform the solid/liquid separation.

The inventive feature of the present invention resides in the reduction of the amount of excess sludge generated during an aerobic biological treatment process by using ozone to oxidatively reduce waste materials containing biosludge and the recycling of the oxidized waste material back into an aerator. That is, the present claims require that either a part of the separated sludge or aerated aqueous suspension withdrawn from the aeration tank be subjected to an ozone treatment at a pH of 5 or lower and that the ozonized aerated aqueous suspension or ozonized part of the separated sludge be recycled back to the aeration tank for further aerobic biological treatment. These steps enable the reduction of excess sludge generated in the aerobic biological treatment process. It is respectfully

submitted that the prior art cited by the Examiner does not disclose such a process.

The primary Dorau et al reference cited by the Examiner discloses a process for the biological purification of sewage in which the substances that are difficult to decompose biologically or are not biologically decomposable are separated and concentrated to form a concentrate and the concentrate is then treated physically and/or chemically and the treated or untreated concentrate subjected to a biological transformation. Alternatively, the concentrate can be separated from the sewage to be purified. In the embodiment of the Dorau et al reference illustrated in the drawing, sewage 1 is introduced into a bioreactor 3 for aerobic treatment and the aerobically treated sludge introduced into a membrane/ultrafilter 9 by a filter pump 8. In the membrane/ultrafilter 9, sludge is separated from filtrate and the sludge is either discarded from the system as excess sludge 13 or returned to the bioreactor 3 as sludge concentrate 12 (referred to as 9 in the figure). The filtrate or biologically purified sewage 11 or untreated sewage 14 are introduced into a filtrate basin 15/1 in which concentrating is carried out by supplying the sewage 16/1 to a membrane/nanofiltering device 19/1.

In stage 4 of Dorau et al, physical or chemical treatment of concentrates 29/1 and 29/2 are performed. It is to be noted that these concentrates are not the sludge which is either removed from the system as excess sludge 13 or returned to the bioreactor as sludge concentrate 12 (9). In the reactor basin 31, the concentrates 29/1 and 29/2 can be subjected to chemical treatment, such as ozone treatment, and then reintroduced back into the bioreactor via charging pump 32. As stated previously, this reference does not show (1) the removal of a portion of an aerated aqueous suspension from the aeration tank, ozone treatment of the aerated aqueous suspension and the returning of the ozonized aerated aqueous suspension back to the aeration tank or (2) performing ozone treatment on part of the sludge formed from the subjection of the aerated aqueous suspension to solid/-

liquid separation and the returning of the ozonized part of the concentrated sludge back to the aeration tank for further aerobic biological treatment. Additionally, the present invention requires that the ozone-treatment of the sludge or aerated aqueous suspension be performed at a pH of 5 or lower. Dorau et al has no disclosure with respect to the pH range at which the contents of reactor basin 31 are subjected to ozone treatment. As shown in Figure 16 of the present application, when the pH is adjusted to be between 3 and 5 prior to the ozone treatment, a much lower amount of ozone is needed to accomplish the desired oxidation. This is clearly unexpected in light of the disclosure of Dorau et al and the secondary references cited by the Examiner must provide teachings that would motivate one of ordinary skill in the art to modify the Dorau et al reference in a manner that will yield the presently claimed invention. It is respectfully submitted that the secondary references contain no such teachings.

Hei et al discloses the use of a potentiated aqueous ozone cleaning composition to remove contaminating soil from a surface. Apparently this reference has been cited by the Examiner for the disclosure at column 3, lines 38-53, regarding solubility and instability of ozone at various pH levels. The fact that ozone may be more unstable at higher pHs has no correlation at all with respect to the reaction efficiency of ozone at the presently claimed pH range. Hei et al discloses that the decomposition of ozone is substantially enhanced as the pH increases past 6. As shown in Figure 16 of the present application, the reaction efficiency at pH 6 is much lower than the claimed upper limit of pH 5. As such, given the unexpectedly high efficiency at the presently claimed pH range of no higher than 5, the Hei et al reference clearly does not teach the presently claimed invention.

The Berndt reference discloses a reactor/sterilizer for disinfecting contaminated medical and/or biological waste and methods thereof. The Berndt reference apparently has been cited for its disclosure at column 4, lines 48-60, that ozone is more stable and more soluble in an aqueous solution as the temperature

of the solution is reduced and at a pH less than about 9. As with the previously discussed Hei et al reference, the Berndt reference has no disclosure that would lead one of ordinary skill in the art to suspect that ozone would have an increased reaction efficiency at the claimed pH range of less than 5, as this reference only discloses that ozone in an aqueous solution is more stable at a pH of less than about 9. As such, Berndt adds nothing to the previously discussed references.

The Kramer et al reference is directed to glassy polymeric gas separation membranes and a process for producing these membranes. Apparently this reference was cited for its disclosure at column 41, lines 14-31, that when ozone is dissolved in water, it behaves chemically like ozone in the gaseous phase as long as the water is at a relatively acidic pH and that at a high pH, a pH greater than 10, ozone is very rapidly destroyed. Like the previously discussed secondary references, Kramer et al has no disclosure with respect to the claimed pH range of less than 5 and improving the reaction efficiency of ozone in the treatment of biological sludge. As such, Kramer et al adds nothing to the previously discussed references.

The Brock reference has been cited by the Examiner for the "well known effect of microorganisms on the pH". Appellants readily admit that microorganisms involved in fermentation are more likely to lower than to raise the pH of their environment. However, since the present invention is not dealing with anaerobic fermentation, Appellants are hard-pressed to see how this reference is relevant to the presently claimed invention.

As discussed above, the primary Dorau et al reference has no teachings with respect to treating biosludge or an aqueous aerated suspension with ozone and then returning the treated biosludge or aqueous aerated suspension back to an aerator for further biological treatment. Not only do the secondary references cited by the Examiner not show or suggest the missing features from the primary Dorau et al reference, they contain no disclosure which would suggest that the oxidative treatment of

the aqueous aerated suspension or the biosludge would be much more efficient at a pH of less than 5. Therefore, the references cited by the Examiner clearly do not meet the requirements of 35 USC 103 with respect to establishing the obviousness of the presently claimed invention.

CONCLUSION

For the reasons discussed above, the Examiner's rejection of the currently pending claims over the cited prior art clearly is in error. Reversal of the Examiner is respectfully solicited.

IN TRIPLICATE

Respectfully submitted,

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APPENDIX

11. (Amended) A process for aerobic biological treatment of an aqueous organic waste comprising the steps of:

introducing the aqueous organic waste into an aeration tank;

aerating the aqueous organic waste in the aeration tank in the presence of a biosludge composed essentially of aerobic microorganisms to form an aerated aqueous suspension;

withdrawing aerated aqueous suspension from the aeration tank and introducing it into a solid/liquid separation unit;

subjecting the aerated aqueous suspension in the solid/liquid separation unit to solid/liquid separation to form a separated sludge containing the biosludge and a separated liquid phase;

withdrawing the separated liquid phase from the process as treated water;

recycling at least a portion of the separated sludge back to the aeration tank;

ozonizating either aerated aqueous suspension withdrawn from the aeration tank or a part of the separated sludge, the ozonizating taking place at a pH of 5 or lower and a greater amount of biosludge being ozonized and converted into BOD components than excess sludge generated in the bioreactor; and

recycling either the ozonized aerated aqueous suspension or the ozonized part of the separated sludge back to the aeration tank for aerobic biological treatment.

2. (Amended) A process according to Claim 11, wherein the ozonizating step is performed at the pH of 5 or lower by an addition of a pH controlling agent.

3. (Amended) A process according to Claim 11, wherein the process further comprises, prior to the step of ozonizating, a step of acidogenesis in which a part of the aerated aqueous suspension in the aeration tank or the separated sludge is subjected to an anaerobic biological treatment to adjust the pH thereof to a value of 5 or lower.

4. (Amended) A process according to Claim 11, wherein the process further comprises a step of heating the aqueous suspension or the sludge to a temperature between 50 and 100°C before or after the ozonizating step.

5. (Amended) A process according to Claim 11, wherein the biosludge in the aeration tank has a VSS/SS ratio maintained at a value of 0.2 - 0.7 and a MLVSS value maintained of 500 - 10000 mg/l.

12. (Amended) A process for aerobic biological treatment of an aqueous organic waste comprising the steps of:

introducing the aqueous organic waste into an aeration tank;

aerating the aqueous organic waste in the aeration tank in the presence of a biosludge composed essentially of aerobic microorganisms to form an aerated aqueous suspension;

withdrawing aerated aqueous suspension from the aeration tank and introducing it into a membrane separation unit;

subjecting the aerated aqueous suspension in the membrane separation unit to membrane separation to form a permeated liquid and a concentrated sludge containing the biosludge;

withdrawing the permeated liquid from the process as treated water;

recycling at least a portion of the concentrated sludge back to the aeration tank;

ozonizating either aerated aqueous suspension withdrawn from the aeration tank or a part of the concentrated sludge, the ozonizating taking place at a pH of 5 or lower and a greater amount of biosludge being ozonized and converted into BOD components than excess sludge generated in the bioreactor; and

recycling either the ozonized aerated aqueous suspension or the ozonized part of the concentrated sludge back to the aeration tank for aerobic biological treatment.